

**Work Order ID 72814**

Tuesday, August 16, 2011 8:00:52 AM

**U/R**

Page 1

Item ID: D350-748-141TRN

Accept



Setup Start



Revision ID: U/R

Stop



Item Name: Crosstube Turning Detail

Start Date: 8/16/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 8/22/2011 Req'd Qty: 1.00

Customer:

Reference:

Approvals: Process Plan:

Date: 12-08-11

Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	Revision Nbr								
D350-748-141	FUR OK 11/19/12								
100		0.00							
	MORI SEIKI CNC LATHE LARGE								
Mori Seiki	Memo	0.00							
Mori Seiki CNC Lathe Large	1-Fill tube with sand & install plugs on both ends as per Folio FA648 2-Turn first side as per Folio FA648 3- File transition lines smooth.								
110	QC1- Inspect dimensions to dimension sheet	0.00							
QC	Memo	0.00							
Quality Control									
120		0.00							
	MORI SEIKI CNC LATHE LARGE								
Mori Seiki	Memo	0.00							
Mori Seiki CNC Lathe Large	1-Turn second side as per Folio FA648 2- File transition lines smooth. 3-Scribe Part & Batch as per Dwg D350-748-141								

1 Ø  
M.M.L 11/08/181 Ø  
M.M.L 11/08/191 Ø  
M.M.L 11/08/19

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

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Run Start

Approvals: Process Plan:

Date:

Tooling:

Date:

Stop

QC:

Date:

SPC (Y/N):

Date:

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

130

QC1- Inspect dimensions to dimension sheet

0.00



QC

Memo

0.00

Quality Control

1 5  
mm.L 11/08/19

140

QC8- Inspect parts - second check

0.00



QC

Memo

0.00

Quality Control

2L 11-08-22

150

Large Fab

0.00



Crosstubes

Memo

0.00

Crosstubes

Grind machining marks

SAP 11-08-22

①

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

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Cust Item ID:

Required Date: 8/22/2011 Req'd Qty: 1.00



Customer:

Reference:

Run Start



Approvals: Process Plan: Date: Tooling: Date:

Stop



QC: Date: SPC (Y/N): Date:

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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160

Outsource process - Heat Treat

0.00



Outsource1

Memo

0.00

Outsource process - Heat Treat

Issue P/O:

14727

Heat Treat to min 180 KSI As per Dwg D350-748-141

(MIL-T-6736 OR AMS 2759-1C)

Sand Blast tube after Heat Treat

Possible Supplier: Vac Aero

Ensure Certificate of Conformity is attached

CL 11/08/24 D

170

Receive &amp; Inspect for Damage &amp; Mat'l Certs

0.00



Packaging

Memo

0.00

Packaging

Ensure certificate of conformaty is attached

Po 11/9/20 C

180

QC6- Inspect dimensions to drawing

0.00



QC

Memo

0.00

Quality Control

Sulorbo

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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**NOTE:** Date & initial all entries

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Page 4

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Cust Item ID:

Required Date: 8/22/2011 Req'd Qty: 1.00



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Process Plan:

Date:

Tooling:

Date:

Run Start



QC:

Date:

SPC (Y/N):

Date:

Stop

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

190

0.00



Packaging

Packaging

Memo

0.00

Packaging

Identify and stock in kanban rack  
Location: Back Hall

mm.l 11/09/20

200

0.00



QC21- Final Inspection - Work Order Release

QC

Memo

0.00

Quality Control

11/9/27  
ME 11-09-27

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



# Picklist Print

Tuesday, August 16, 2011 8:00:59 AM

Page 1

Work Order ID: 72814

Parent Item: D350-748-141TRN

Parent Item Name: Crosstube Turning Detail

Start Date: 8/16/2011

Required Date: 8/22/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A New Issue 08-03-06 DD verified by:ec  
IPP Rev B Removed polish 08.04.02 EC verified by : DD  
IPP Rev C Remove LPS-3 08.06.23 EC verified by DD IPP Rev C  
11.02.24 as per dwg rev.F DD verf: JLM

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
---------------------------------	------------------------	---------------	-------------	---------------------	------------------	-----------------	--------------------	----------------	-------------	--------------	---------------	----------------	--------

D6015-125

Manufactured

No

110

Each

30.0000

1

1



Crosstube Material

Location

Loc Qty

Loc Code

HALL

30

61380

30

mm.L 11/08/18

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

<b>DART AEROSPACE LTD</b>		<b>Work Order:</b> 72814
<b>Description:</b> Crosstube Assembly (AS350/355 High Fwd)		<b>Part Number:</b> D350-748-141
<b>Inspection Dwg:</b> D350-748-141 <b>Rev:</b> F		<b>Page 1 of 1</b>

### FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.243	✓		mic	CNC-01
	2.180	+0.005/-0.000	2.183	✓		"	
	2.180	+0.005/-0.000	2.183	✓		"	
	2.237	+0.005/-0.000	2.238	✓		"	
	2.272	+0.005/-0.000	2.273	✓		"	
	2.306	+0.005/-0.000	2.307	✓		"	
	2.339	+0.007/-0.000	2.340	✓		"	
	2.339	+0.007/-0.000	2.346	✓		"	
	0.062	+/-0.010	.062	✓		vern	JF-01
	4.26	+/-0.030	4.26	✓		"	
	R0.063	+/-0.010	.063	✓		RG	
	R0.50	+/-0.030	.500	✓		"	
SIDE B	2.240	+0.005/-0.000	2.244			mic	CNC-04
	2.180	+0.005/-0.000	2.183			"	
	2.180	+0.005/-0.000	2.183			"	
	2.237	+0.005/-0.000	2.239			"	
	2.272	+0.005/-0.000	2.273			"	
	2.306	+0.005/-0.000	2.307			"	
	2.339	+0.007/-0.000	2.339			"	
	2.339	+0.007/-0.000	2.346	✓		"	
	0.062	+/-0.010	.062	✓		vern	JF-01
	4.26	+/-0.030	4.26			"	
	R0.063	+/-0.010	.063	✓		RG	
	R0.50	+/-0.030	.560			"	
	110.27	+/-0.060	110.26	✓		tape	MM-L-02

<b>Measured by:</b> MML	<b>Audited by:</b> J	<b>Preliminary Approval:</b>
<b>Date:</b> 11/08/16	<b>Date:</b> 11-08-22	<b>Date:</b>

Rev	Date	Change	Revised by	Approved
A	06.11.09	New Issue (P/O D350-748-101)	KJ/JLM	
B	07.10.24	Dwg Rev updated	KJ/EC/DD	
C	11.01.20	Dwg Rev updated	KJ	
D	11.07.26	Tolerance revised for 2.339 dimensions	KJ	

Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

# **GENERAL NOTES:**

- MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115  
FINISHED LENGTH = 110.270±0.06
- FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- WEIGHT: 30.45 lbs
- PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.  
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- HEAT TREAT TO MIN 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY

RETURN TO

ENGINEERING

UNCONTROLLED COPY

SUBJECT TO AMENDMENT

WITHOUT NOTICE

WORK ORDER

NO. 72864

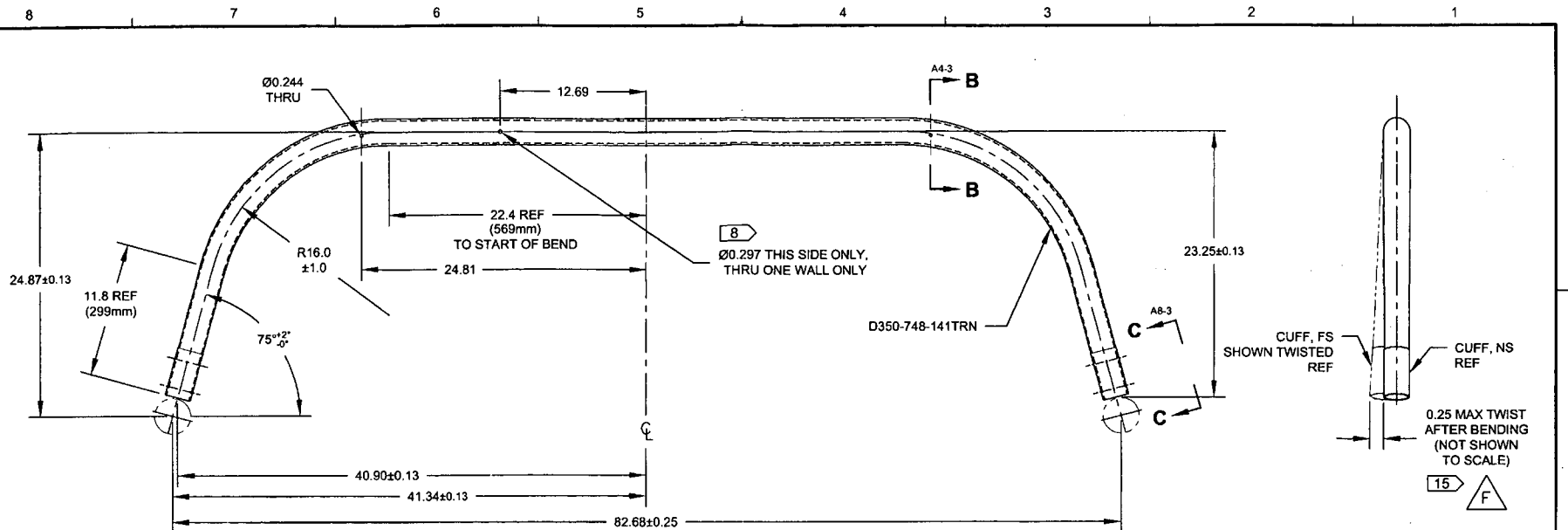
UNDER REVIEW

11.07.12

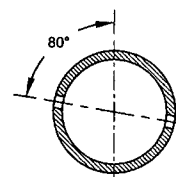
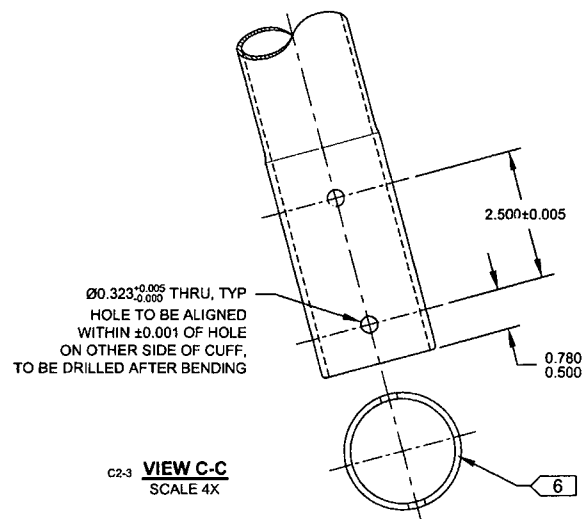
RELEASED  
2011-01-18

F	ADD HRC TEST OPTION (B8-1) PER PAR 09-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN	90	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	90		
CHECKED	90	DRAWING NO.	REV. F
MFG. APPR.	90	D350-748-141	SHEET 1 OF 4
APPROVED	90	TITLE	SCALE
DE APPR.	90	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	COPYRIGHT © 2006 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD	





**D350-748-141**  
**BENDING AND DRILLING DETAIL** 10

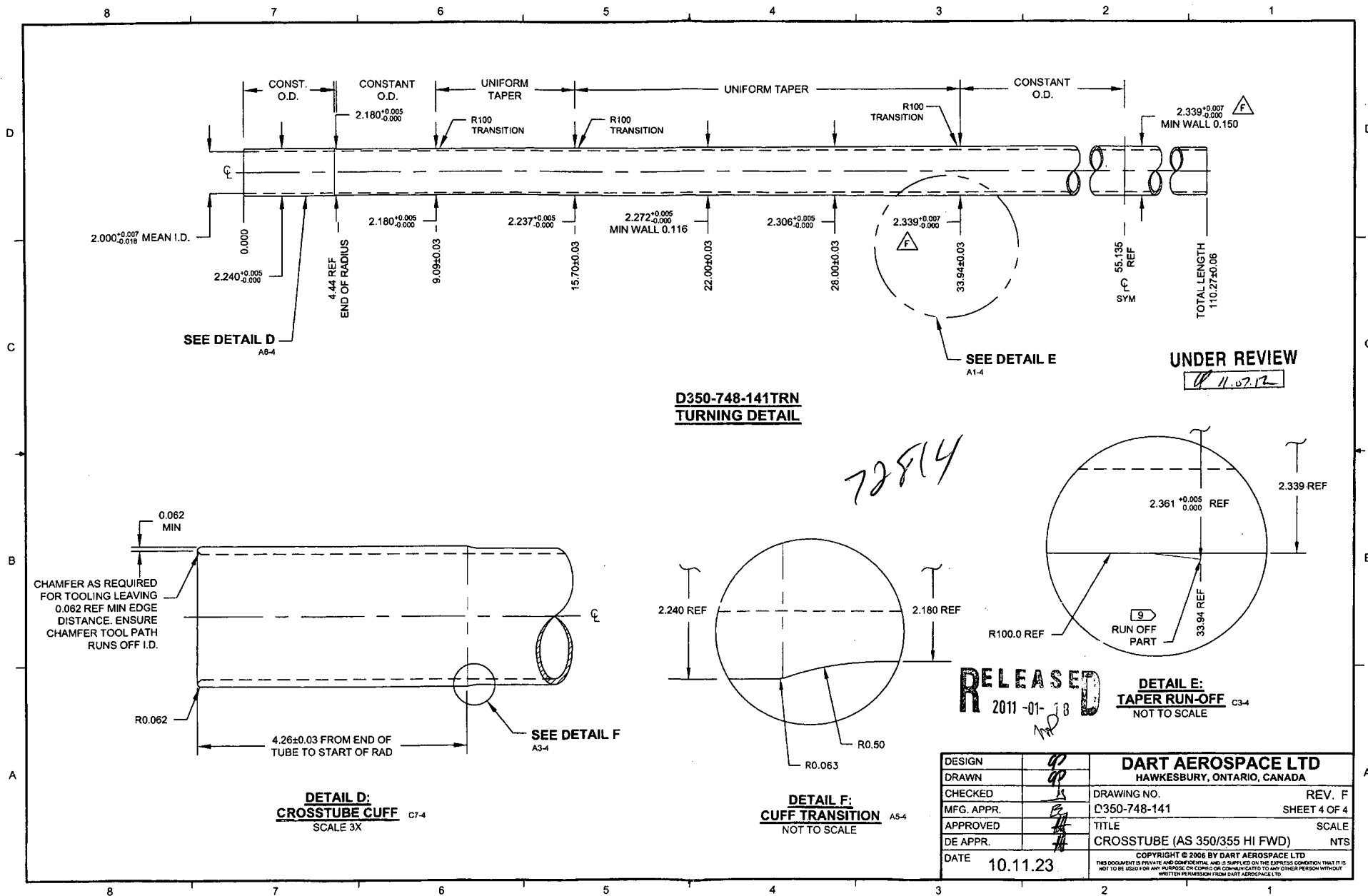


72814

UNDER REVIEW  
 11.27.12

RELEASED  
 2011-01-18

DESIGN	QP	<b>DART AEROSPACE LTD</b>	
DRAWN	QP	HAWKESBURY, ONTARIO, CANADA	
CHECKED	GP	DRAWING NO.	REV. F
MFG. APPR.	GP	D350-748-141	SHEET 3 OF 4
APPROVED	GP	TITLE	SCALE
DE APPR.	GP	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	COPYRIGHT © 2006 BY DART AEROSPACE LTD	
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**VAC AERO**  
INTERNATIONAL INC.

**RELEASE NOTE**

GST No. : R105468102

OAK 133773-1



HEAD OFFICE  
1371 SPEERS ROAD, OAKVILLE, ONTARIO  
CANADA L6L 2X5  
TEL: (905) 827-4171 FAX: (905) 827-7489



2009 WYECROFT ROAD, UNIT B  
OAKVILLE, ONTARIO  
CANADA L6L 6J4  
TEL: (905) 827-7377 FAX: (905) 827-1380



QUEBEC DIVISION  
7450 RUE VÉRITÉ STREET, ST. LAURENT, QUÉBEC  
CANADA H4S 1C5  
TEL: (514) 334-4240 FAX: (514) 334-6269

09/22/2011

MM / DD / YYYY

PAGE : 1

BILL TO: 1DAR01  
DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

SHIP TO: DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

K6A 1K7

K6A 1K7

DATE SHIPPED	SHIP VIA	F.O.B.
09/22/2011		ORIGIN
CUSTOMER P/O No.	JOB No.	TERMS
P014727		NET 30 DAYS

PART No.	DESCRIPTION	UOM	QTY ORD	QTY SHPD	TEST RESULTS
D350-748	-141 CROSS TUBE	EA	12	12	
Process Specifications: Procedure: 4353 HEAT TREATED TO 180 KSI MIN. PER AMS 2759-1E 100% HARDNESS CHECKED AS PER ASTM E-18 40/45 HRC MATERIAL: 4130					
LINE# 70650,	1 PC	LINE# 72812,	1 PC		
LINE# 70652,	1 PC	LINE# 72813,	1 PC		
LINE# 72334,	1 PC	LINE# 72814,	1 PC		
LINE# 72335,	1 PC	LINE# 72815,	1 PC		
LINE# 72336,	1 PC	LINE# 72816,	1 PC		
LINE# 72337,	1 PC	LINE# 72817,	1 PC		

100% HARDNESS TESTED  
44/45 HRC  
2280/11



I hereby certify that the material covered by this release note has been inspected and tested and conforms to all specifications relevant thereto in accordance with the conditions of the contract / or purchase order.

ON BEHALF OF VAC AERO INTERNATIONAL INC.



METAL TREATING INSTITUTE

Authorized Q.C. Inspector



Heat Treating - Welding

VACUUM BRAZING - HEAT TREATING - SPECIAL PROCESSING - FURNACE EQUIPMENT  
TURBINE COMPONENT OVERHAUL - PLASMA AND OTHER COATINGS